TO OUR HEALTH!

OCEANS AND HUMAN HEALTH

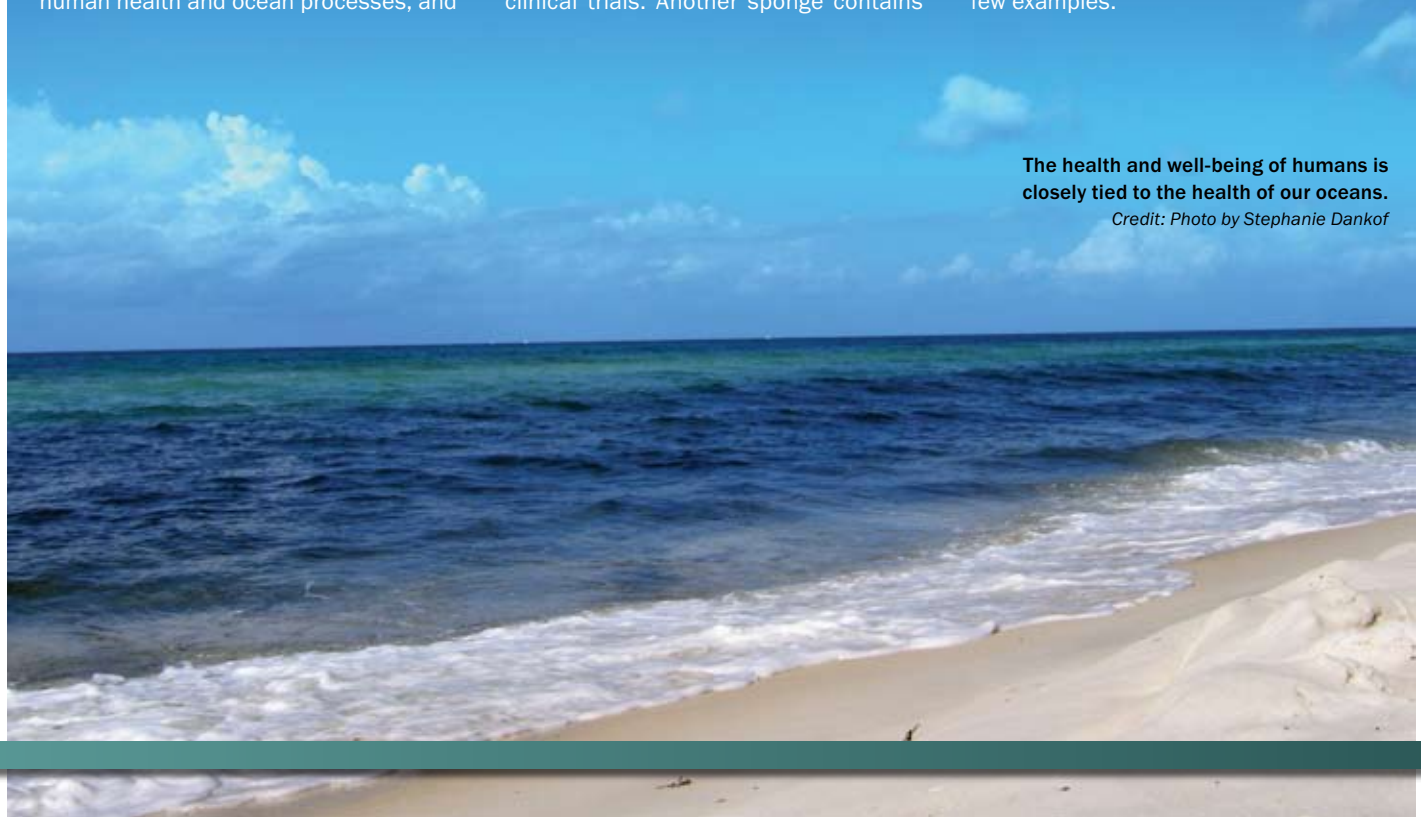
BY BARBARA STAHURA

Without oceans, the Earth would be little more than a cinder orbiting the sun. Covering more than 70 percent of the planet, the oceans comprise the largest, most important performer in an intricate dance of elements that allows our world to support a vast and vigorous variety of life forms. Humans exist in a delicate relationship with the ocean, and many of our interactions with this vast body of water — pollution, global climate change, and coastal development — are creating unhealthy effects. As we disrupt the health of the ocean and its inhabitants, we also affect our own.

In its capacity as the major U.S. agency with a mandate to investigate the ocean and the Great Lakes, NOAA has long studied this watery world (see sidebar on page 114). NOAA's ocean mission expanded in 2004 with the creation of the Oceans and Human Health Initiative (OHHI). Through OHHI, NOAA cooperates with other federal agencies such as the National Science Foundation and the National Institute of Environmental Health Sciences, state agencies, and academic and private-sector organizations as they seek "to understand the nature of interactions between human health and ocean processes, and to provide useful information to policy- and decision-makers."

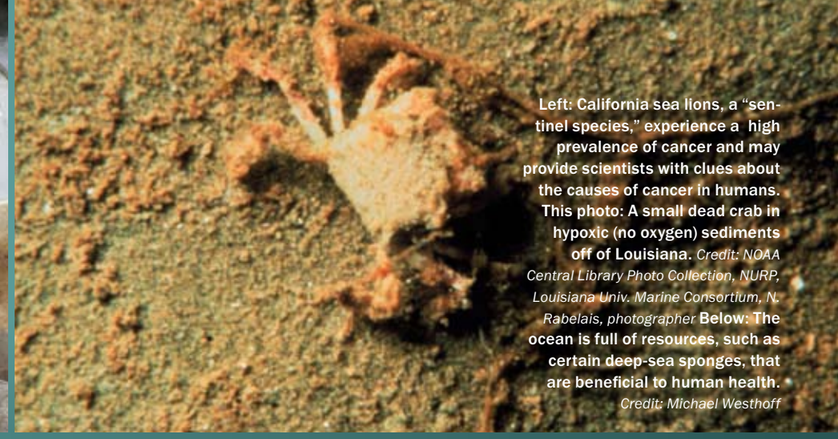
The OHHI focuses on the ocean's positive and negative effects on human health and well-being. The positive effects include seafood harvesting and the ecologically-sound discovery of natural products and pharmaceuticals from marine life. Ocean exploration has uncovered thousands of resources that could be used for medical purposes. For instance, a deep-sea sponge was found to contain a substance called discodermolide, an anti-tumor agent now in clinical trials. Another sponge contains compounds now under development as additives in anti-inflammatory skin cream. The negative effects on human health include marine toxins and infectious diseases, chemical pollutants, and harmful algal blooms.

The OHHI is taking an ecosystem-based approach to the research and management of our oceans' health — a comprehensive approach that is geographically specified, considers multiple influences, and strives to balance diverse societal objectives. Many of these elements work together in close relationship. Here are a few examples.



The health and well-being of humans is closely tied to the health of our oceans.
Credit: Photo by Stephanie Dankof

The type of algal bloom known as red tide not only kills various marine life but can cause respiratory distress in people. *Credit: Photo by Brian Dombrowski*



Left: California sea lions, a "sentinel species," experience a high prevalence of cancer and may provide scientists with clues about the causes of cancer in humans. This photo: A small dead crab in hypoxic (no oxygen) sediments off of Louisiana. *Credit: NOAA Central Library Photo Collection, NURP, Louisiana Univ. Marine Consortium, N. Rabelais, photographer* **Below: The ocean is full of resources, such as certain deep-sea sponges, that are beneficial to human health.** *Credit: Michael Westhoff*

Harmful Algal Blooms

Blooms — extremely high densities of toxic algae — appear with some frequency on U.S. coasts. For instance, nearly every year the Gulf Coast of Florida experiences an explosion, dubbed a "red tide," which closes shellfish beds, kills fish, dolphins, and manatees, and causes respiratory distress in people. If these toxic blooms can be accurately predicted, communities can take action to deal with their environmental and health effects, as well as economic pressures. Harmful algal blooms now cause about $82 million in losses for the seafood, restaurant, and tourism industries annually.

Dead Zones

An estimated 200 "dead zones" have been identified in the world's waterways. They are created when an explosive growth of very tiny plants called phytoplankton feasts on nutrients in the fertilizers and sewage swept into the water. When the phytoplankton die and sink to the bottom, they in turn are gobbled up by bacteria that deplete oxygen in the water, effectively strangling all life.

The best-known dead zone is in the Gulf of Mexico, stretching hundreds of miles from the Louisiana coast. It is fed by nutrient-rich pollutants from farmlands far north of the Gulf, which are carried into Midwest and Southern rivers that empty into the Mississippi River.

Sentinel Species

Marine animals can be considered the wet version of "the canary in the coal mine." Just as miners once carried caged canaries as sentinels of toxic gases or lack of oxygen, NOAA today studies the health of some marine "sentinel species" to determine developing problems in the ocean. For instance, California sea lions have a high prevalence of cancer, which may be due to high levels of contaminants. By studying these sea lions, scientists may be able to learn more about the causes of human cancer. NOAA has also studied grass shrimp and found them to be a good indicator of ecological conditions along the East and Gulf Coasts.

Oceans and Human Health Initiative — www.eol.ucar.edu/projects/ohhi

CENTER OF EXCELLENCE FOR GREAT LAKES AND HUMAN HEALTH

The Great Lakes are the world's largest source of freshwater and the source of 90 percent of the surface drinking water in the United States. Their shores are lined with more than 500 recreational beaches, and their waters support $4 billion worth of commercial and sport fishing enterprises. To protect the health of these precious resources, NOAA created the Center of Excellence for Great Lakes and Human Health (CEGLHH), a partnership led by the Great Lakes Environmental Research Laboratory (GLERL) in Ann Arbor, Mich. CEGLHH is one of three NOAA Centers for Excellence established under the Oceans and Human Health Initiative; the other two are located in Seattle, Wash., and Charleston, S.C.

Currently funded through 2009, the Center of Excellence for Great Lakes and Human Health uses an integrated approach to study the Great Lakes' water quality as it relates to human health, particularly beach closures, harmful algal blooms, and drinking water. Never before has such a deeply integrated study of these lakes been undertaken. NOAA is clearly the most qualified agency to undertake this work, using a multidisciplinary approach that includes hydrology, climate, meteorology, and other disciplines. Among areas to be studied are urban and agricultural runoff, industrial sewage, shorebird droppings, lake circulation, pathogens, and harmful algae growth — all of which can combine into a toxic soup unhealthy for humans and other living things.